

to live but also in which it is worth living. The natural area, so-called because the works of man are not significant elements in its composition, is an outdoor laboratory and, as such, it is the only apparatus by which we can gauge the changes that occur in the regions dominated and modified by man. These reserves are the only frame of reference we have. In them we can make observations with a minimum of disturbance, or carry out controlled and carefully recorded environmental manipulations to determine how ecosystems actually function in nature. This sort of research contributes to our ability to predict the consequences of man's alteration of his environment.

The Smithsonian Institution encourages, and aids where possible, the establishment of natural areas for research, education, and a means of communicating ecological ideas to society. The Chesapeake Bay Center for Field Biology, under the administration of the Office of Ecology, reflects this interest and activity. Such areas must be under the best protection that society can provide through its laws and institutions; and the 120 years of Smithsonian tradition in preserving objects of cultural and scientific importance provides assurance that natural areas, which might be thought of as outdoor museums, will be saved in perpetuity for science and society.

While emphasis is placed on the higher orders of biological integration and on the conservation and study of natural ecosystems, the Smithsonian ecology program also includes species-oriented ecology, and the biological problems related to urban development are not excluded. And although research is given priority, the ecology program is also deeply committed to education and to the diffusion of sound ecological information throughout society. In this sphere its efforts are directed toward constructing a conceptual framework, drawing upon the humanities, the behavioral sciences, and the natural sciences, that will enable man to deal purposively with his world on the level of human society-plus-its-total-environment. To gather these strands together, research is being linked with university education at home and abroad, and contemporary ecological thought is being transmitted through lectures, seminars, and publications.

If we accept the thesis that advancement of scientific theory about ecosystems and man's place in these systems is oriented primarily around the understanding of how they actually behave in nature, then with sufficient knowledge about how ecosystems work, we may be able to manage them in the best interests of society by manipulating the controlling (or regulatory) processes. Increasing our understanding of how an ecosystem works requires two general types of research.

One type of research is concerned with basic descriptions: (1) of the physical, chemical, and biotic components of the system; (2) of the structural and functional relationships of these components to each other and to the system as a whole; (3) of the variations of the system in time and space; and (4) of the environmental relationships of the system to other ecological systems. The total systems approach, embracing climate, soils, hydrology, vegetation, and animal life—including man—provides a foundation for studies of regulatory processes.

These basic descriptions require a solid foundation in the taxonomy of the species components; precise identification of plants, animals, and other organisms is fundamental to the advancement of ecological theory. Basic descriptions, also include preliminary interpretations.